PO.DAAC Metadata Best Practices and Vision Beyond 2015

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Outline

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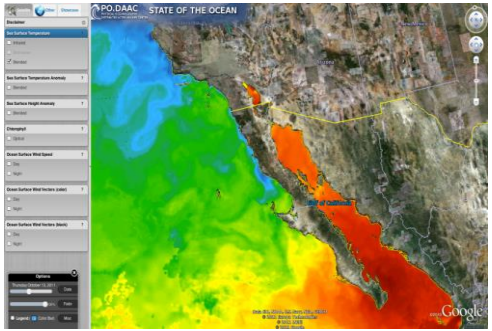
What is PO.DAAC?

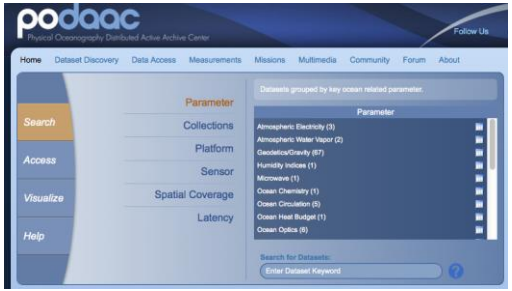
Data Management & Stewardship

Preserve NASA's data for the benefit of future generations

Data Access

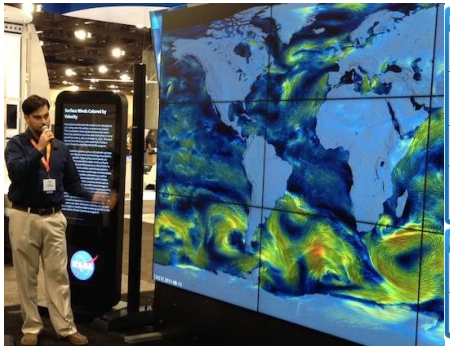
Provide intuitive services to discover, select, extract and utilize data





Science Information Services

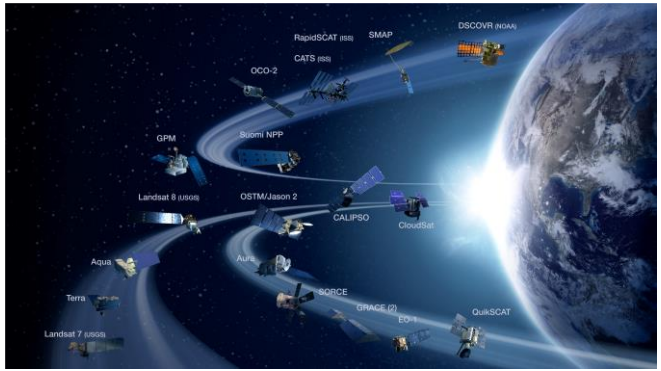
Provide a knowledgebase to help a broad user community understand and interpret satellite ocean data and related information



Variety of Data Holdings

NASA Missions & Projects

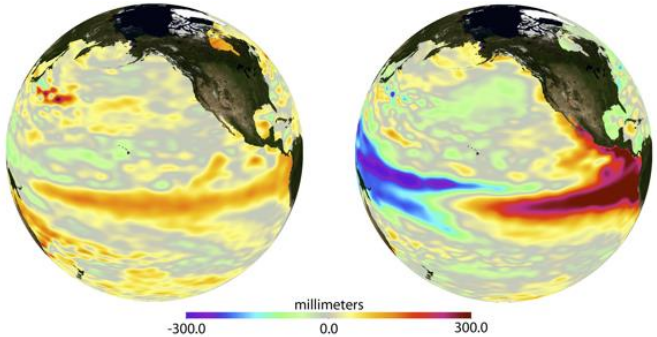
Seasat, TOPEX/Poseidon, Jason-1, NSCAT, SeaWinds on ADEOS-II, QuikSCAT, GRACE, GHRSST, MEaSUREs, Aquarius, SPURS, ISS-RapidScat, CYGNSS (2016), GRACE-FO (2017), SWOT (2020)



Ocean & Climate Community Driven

Value-added datasets in support of NASA programs

Gravity, Ocean Circulation & Currents, Ocean Surface Salinity, Ocean Surface Topography, Ocean Vector Winds, Sea Surface Temperature, *Ocean Color, Sea Ice*



Variety of Data Formats

- Interoperable and Self-Describing:
  - netCDF-3, netCDF-4 (classic and enhanced), HDF-4, HDF-5
  - 75% of our public-domain datasets
- Legacy (i.e., outdated; limited interoperability)
  - ASCII, flat binary, GIF, JPEG, PNG
  - 25% of our public-domain datasets
- Overall, both science data users and data producers are increasingly aware and becoming more preferential toward self-describing and interoperable data formats.

Metadata Standards

- What we currently adhere to:
  - Dataset/Collection: ISO 19115, ISO 8601, GCMD*, ECHO/REVERB*
  - Granule/File: CF, ACDD, ISO 8601, GHRSST GDS-2*
- What we are planning to implement:
  - Consolidated Metadata Repository* (CMR)
  - ISO 19157
- Who we are in communication with:
  - ESIP: CF Standards, Information Quality, Interoperability and Information Technology, Preservation and Stewardship
  - ESDSWG: Citations, Data Quality, Interoperability, Provenance, Search Relevancy

* Denotes NASA-proprietary standards

Metadata Harvesting: Dataset/Collection

- Submission Agreement (a.k.a MOU, Inter-Project Agreement)
  - document to kick off our ability to ingest new datasets and metadata
  - provides preliminary collection/dataset metadata
- Data Management and Archiving System (DMAS):
  - Compliant with ISO 19115, GMCD, and ECHO/REVERB
    - will eventually support CMR
  - Supports SQL-based backend query, modification, and extraction
- Data Management Tool (DMT):
  - Web-based GUI to submit dataset/collection metadata
  - Interfaces directly with DMAS

Metadata Harvesting: Granule

- Stored in DMAS
  - enables flexible collection and harvesting of metadata in real-time
  - required metadata collection artifacts are specified using DMT
- Data Handler
  - an automated tool that interfaces with a web-crawler to search, extract, and archive the data granules/files and corresponding metadata
  - both generic and custom-configurations are available
  - can be used in both “push” and “pull” data ingest modes

Supporting Interoperability

- Web Services: http://podaac.jpl.nasa.gov/ws/
- OPenDAP: http://opendap.jpl.nasa.gov/
- THREDDS: http://thredds.jpl.nasa.gov/
- Webification (w10n): http://podaac-w10n.jpl.nasa.gov/
- Advocating use of CF and ACDD, thus enabling extended interoperability:
  - Panoply, THREDDS, and many APIs that rely on THREDDS servers

Supporting Data Quality

- ISO 19157 is being scoped out by ESDIS and PO.DAAC.
  - Addresses data quality at the dataset/collection-level.
  - Functions as a container for data quality attributes and data quality variables.
  - Recommended by NASA Data Quality Working Group and industry experts.
- CF quality flag attributes address data quality at the granule level.
- GHRSST GDS-1 and GDS-2 both address data quality at the granule level.
  - Standardized quality flagging for all SST datasets.
  - Standardized uncertainty estimates at the pixel level.
- Data Granule/File integrity validation via MD5 Checksum
- Documentation: User Guides, READMEs, References to Refereed Literature
- User Forums: https://podaac.jpl.nasa.gov/forum/

Completeness and Conformity

- Metadata Compliance Checker (MCC):
  - http://podaac-uat.jpl.nasa.gov/mcc/
  - Automated granule/file metadata completeness and compliance checking
  - ACDD, CF, ISO-8601, GHRSST GDS-2
  - Supports manual single-file upload and OPeNDAP URLs
  - Output options: HTML or PDF
  - Still in Beta state with further development being scoped out
- Web Portal and DMT:
  - Functions as a visual validation tool to ensure dataset/collection metadata is complete and consistent for all PO.DAAC datasets.
  - DMT is used to make quick edits in real-time.
- GCMD, ECHO/REVERB:
  - Functions as an external validation tool to ensure both completeness and standards compliance to ISO 19115 as well as NASA-proprietary GCMD and ECHO/REVERB standards.

Beyond 2015

- Online dataset/collection metadata submission form for data producers.
  - Point of entry for new datasets to be archived and distributed.
  - Compatible with DMAS and DMT.
  - DMT would be used to by DAAC Data Engineers to make final edits.
- Granule/file metadata editor:
  - Leveraging NCO utilities package to edit data variable and global attributes.
  - Provides retroactive and non-intrusive metadata completeness and compliance to ACDD, CF, ISO-8601.
  - Leveraging MCC backend to validate metadata completeness and compliance.
  - Would help to bring “dark data” into the modern age of provenance and interoperability.

Conclusions

- More users are preferring interoperable, self-describing data formats.
- Data Producers have only recently started catching up with this user demand, hence why many require some tutelage with standards:
  - MCC provides a nice entry point at validating and understanding metadata completeness and compliance at granule level.
- With increased self-description comes the need for standardized metadata.
  - CF, ACDD, and ISO provide thorough guidance in this regard.
  - CF and ACDD go a step beyond ISO to ensure broad and long-term interoperability.
- DAACs and other data centers may need non-invasive metadata editing tools to transform “dark” datasets into the modern-era of interoperability.
  - Data Producers may also find such tools to be quite useful: e.g., NOAA CDR, MEaSUREs

Questions/Feedback

- Data Best Practices:
  - https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices